Classifying day and night station areas: application of the node-place model in Greater London

Enrica Papa
University of Westminster
Department of Planning and Transport
e.papa@westminster.ac.uk

Gerardo Carpentieri
University of Naples
DICEA
gerardo.carpentieri@unina.it

UNIVERSITY OF
LEADING
THE WAY
WESTMINSTER

Intro

Transit Oriented Development

- Many efforts towards the sustainable development of transport and land use foster concentration strategies around nodes of public transport have become a key topic in urban planning (TOD)

Intro

Classification of station areas and context-based TOD typologies

- The characteristics and functioning of the stations within such a portfolio vary strongly. Its specific applications greatly differ in form, function and impacts, calling **for context-based TOD typologies**

- A classification enables local governments and developers to invest in each type of TOD to achieve a better overall leverage of benefits across metropolitan areas

- Existing classifications rely strongly on the indicator ‘‘passenger frequency’’, which focuses only on transport related issues, blending performance with preconditions at a given site.

- Transport and land use characteristics should be considered at the same time

The London context

TOD typology for London

The new London Plan (2017): good growth policies

- Strategic approach to transport
- Spatial development patterns (opportunities areas; growth locations)
- Increasing housing supply
- Weak land use and rail transport network strategy at the regional scale
- No station areas classification

The London context

TOD typology for London

Night Tube and night economy

- New services during the night shaping new opportunity scenarios for night economy activities
- Transport as a key factor to unlock economy activity (Policy HC6 – London Plan, 2017)
- Limitations in transport land use integrated strategies for the night hours

UNIVERSITY OF WESTMINSTER
LEADING THE WAY

Identifying TOD strategies in London

Research question

Research goal:

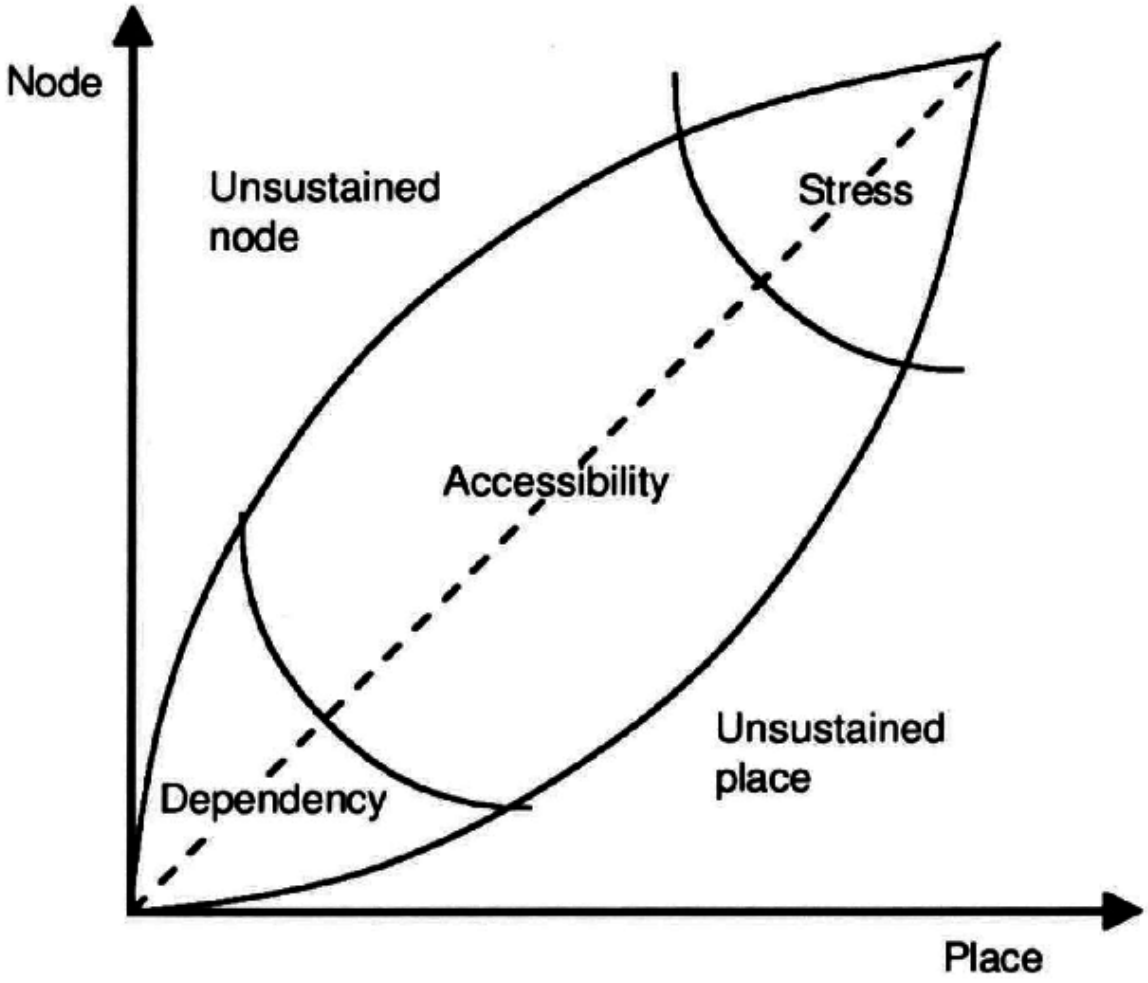
- Developing a TOD typology for the London context

Sub questions:

- What the characteristics of London station areas (during the day and the night)?
- Which possible policies could be defined for those clusters / each stations?

Theoretical background

The node-place model (Bertolini, 1999)



Methodology

Application of the node-place model in the London context

1. **Selection of node and place indicators from international TOD literature**
   - systematic review of studies and selection of indicators
   - Local experts interviews
   - Data availability

2. **Definition of TOD areas**
   - 252 station areas (day)
   - 141 station areas (night)

3. **Measurement of indicators**

4. **Cluster analysis** to identify distinct types of station areas

Methodology

Application of the node-place model in the London context

Day indicators

Place indicators	Name
D_P1	total population in the station area
D_P2	total jobs in the station area
D_P3	ethnic functional mix
D_P4	high skills employers index
D_P5	low skills employers index
D_P6	mix index employers
D_P7	functional mix
D_P8	children index

Node indicators	Name
D_N1	number bus stops in station area
D_N2	travel time to the centre of London
D_N3	average PTAL _ Public Transport Accessibility Level
D_N4	congestion charge (y/n)
D_N5	number of cycle hire in station area
D_N6	station use (week)
D_N7	station use day (week end)
D_N8	number of stations within 20 min of travel by tube

Methodology

Application of the node-place model in the London context

Night indicators

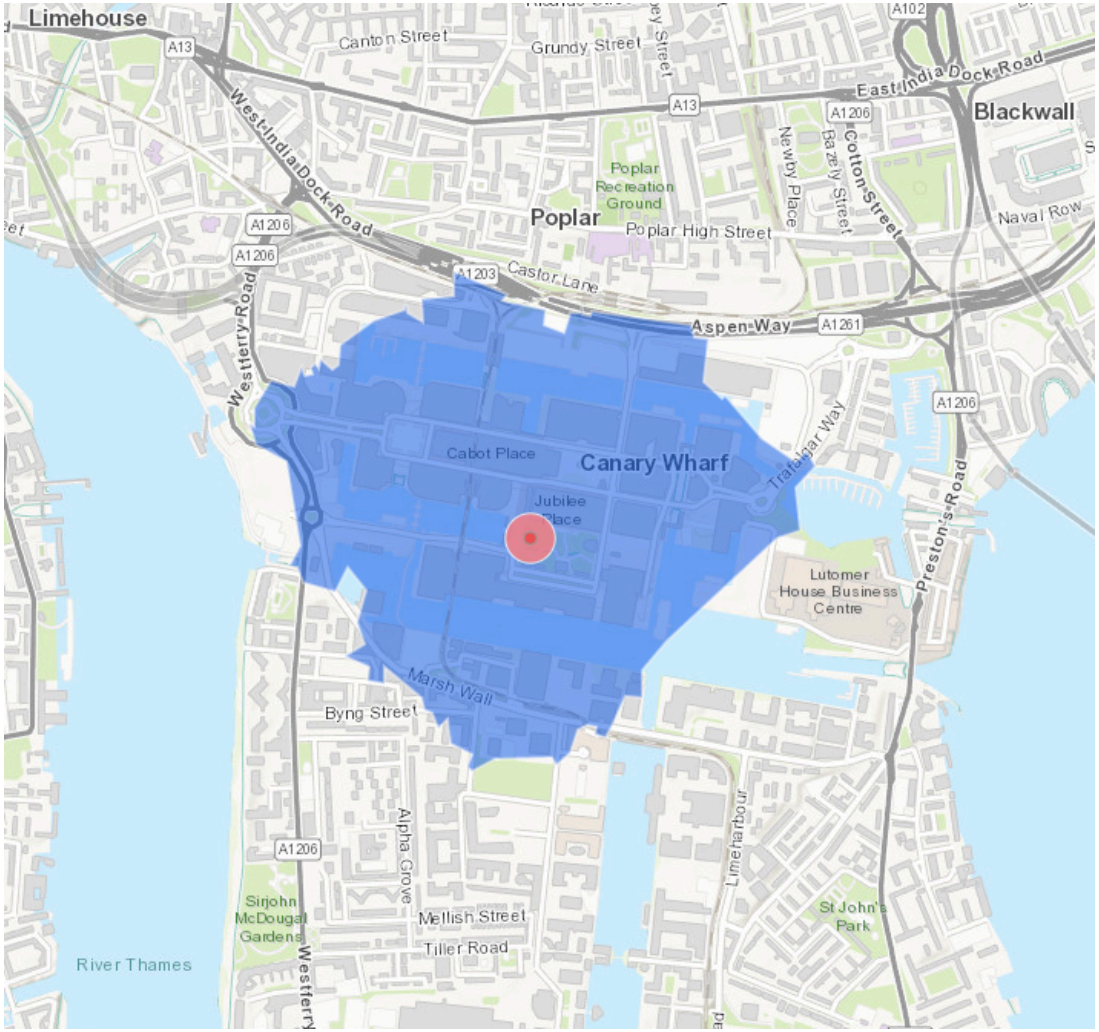
Place indicators	Name
N_P1	total population in the station area
N_P2	total jobs in the station area
N_P3	ethnic functional mix
N_P4	number of high skills employers
N_P5	number of low skills employers
N_P6	mix index employers
N_P7	functional mix

Node indicators	Name
N_N1	station use night (in + out)
N_N2	travel time to the centre of London by night
N_N3	average PTAL _ Public transport accessibility level
N_N4	Night tube frequency
N_N5	Number of stations within 20 min of travel by metro by night
N_N6	number of cycle hire in station area

Methodology

Station area identification

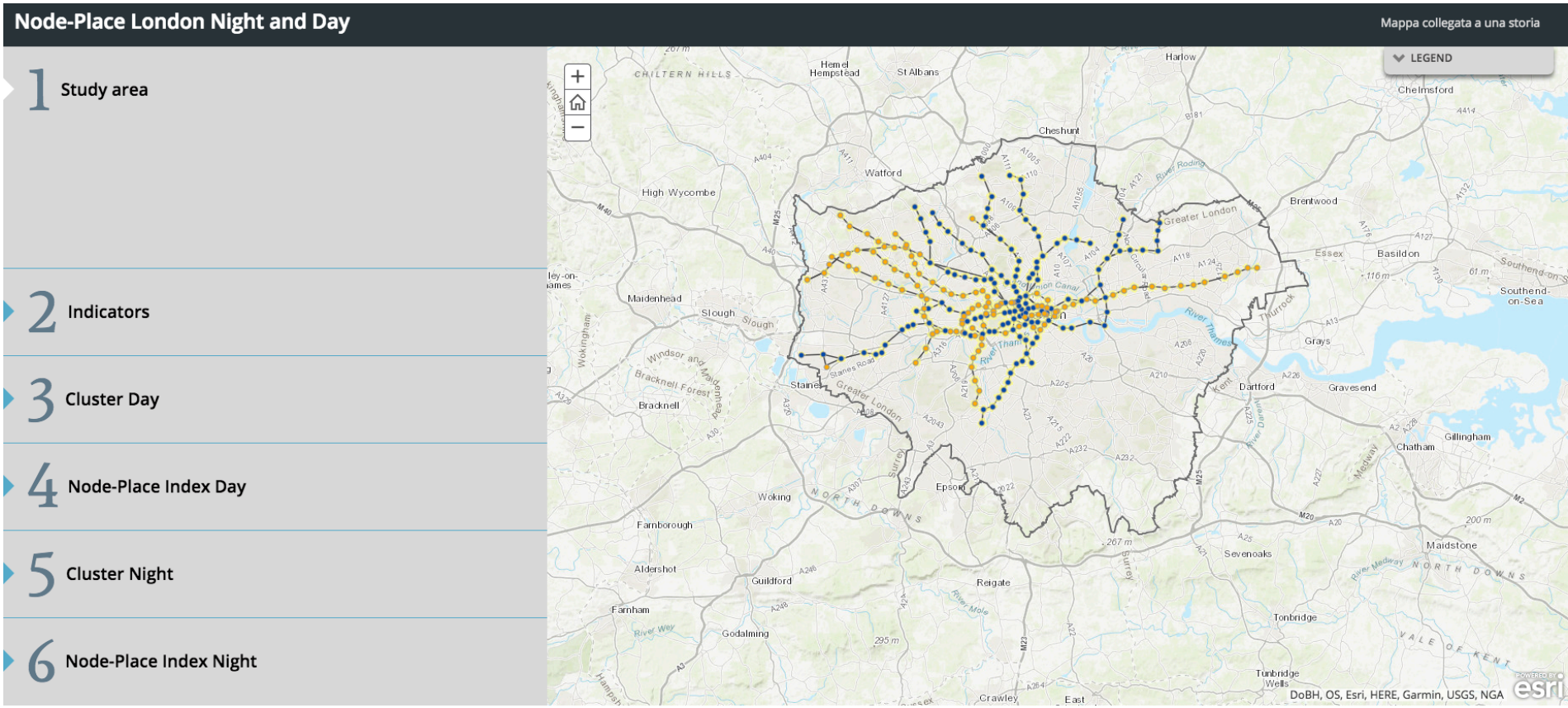
Walkable area from the station exits in 700m, measured in the pedestrian street network



UNIVERSITY OF
LEADING
THE WAY
WESTMINSTER

Output

An online GIS platform



https://arcg.is/Tfn8K

https://uowestminster.maps.arcgis.com/apps/MapSeries/index.html?appid=cec05103faf94176b2d7e9651ccf6d41

UNIVERSITY OF
LEADING
THE WAY
WESTMINSTER

Output
indicators

Node-Place London Night and Day

Mappa collegata a una storia

1 Study area

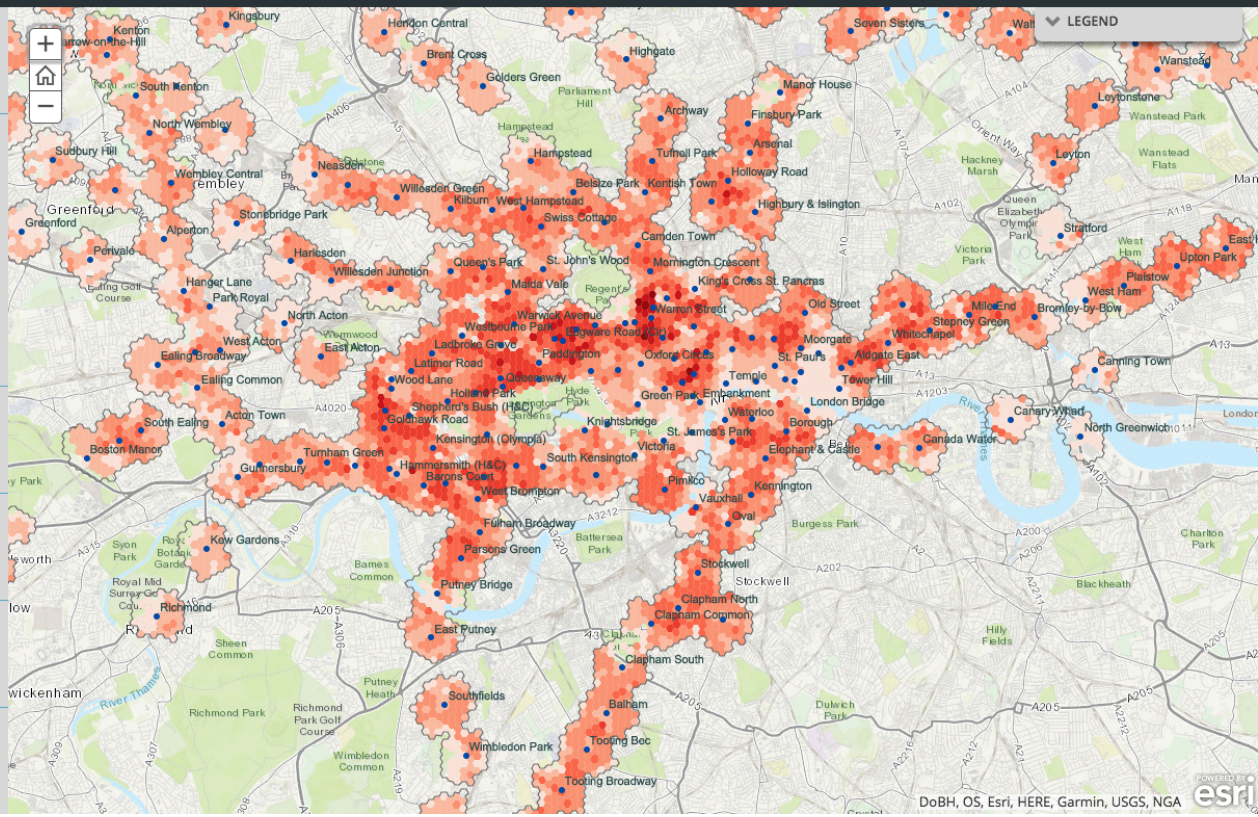
2 Indicators

3 Cluster Day

4 Node-Place Index Day

5 Cluster Night

6 Node-Place Index Night



UNIVERSITY OF LEADING THE WAY WESTMINSTER

Output

Node-place day

Node-Place London Night and Day

Mappa collegata a una storia

1 Study area

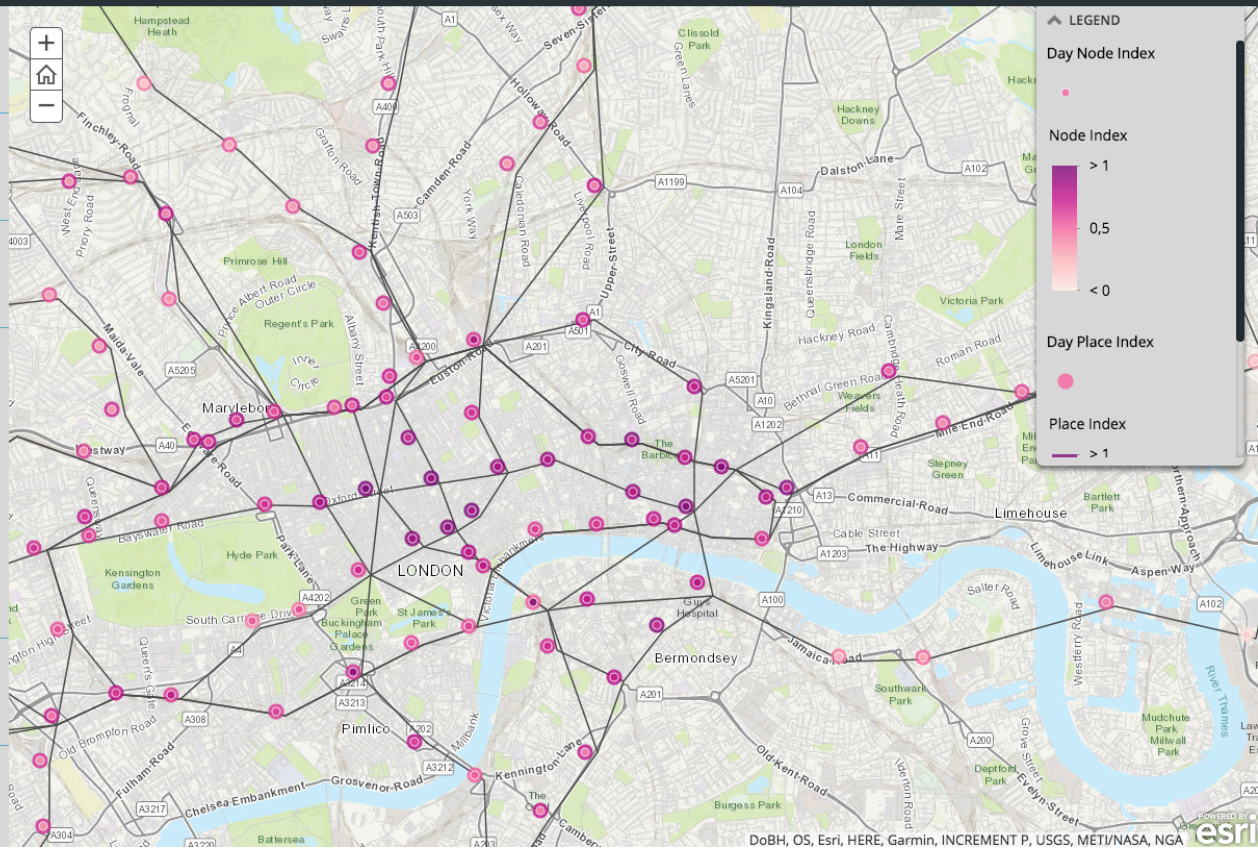
2 Indicators

3 Cluster Day

4 Node-Place Index Day

5 Cluster Night

6 Node-Place Index Night



UNIVERSITY OF LEADING THE WAY WESTMINSTER

Output

Station areas cluster analysis - day

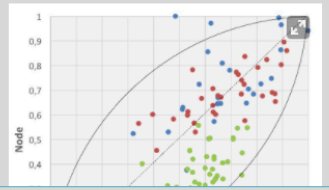
Node-Place London Night and Day

Mappa collegata a una storia

1 Study area

2 Indicators

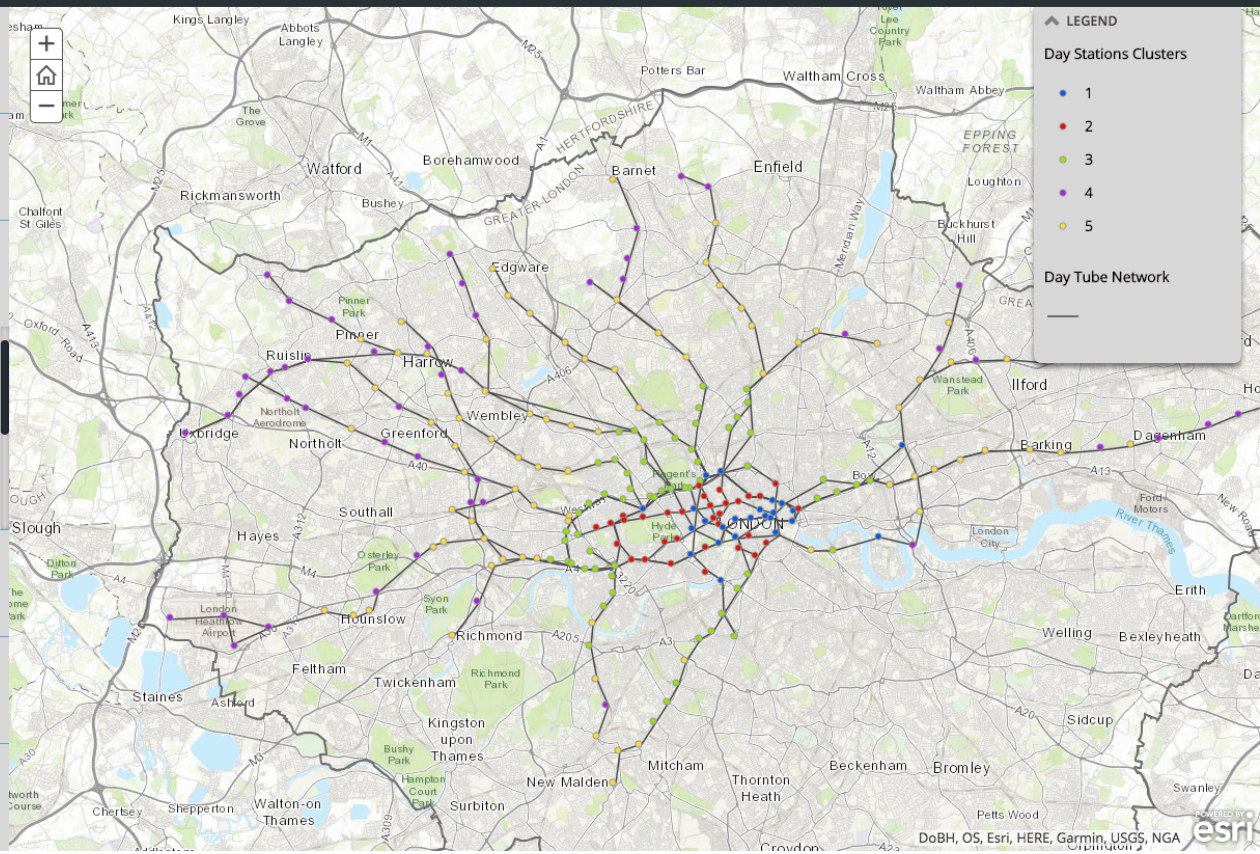
3 Cluster Day



4 Node-Place Index Day

5 Cluster Night

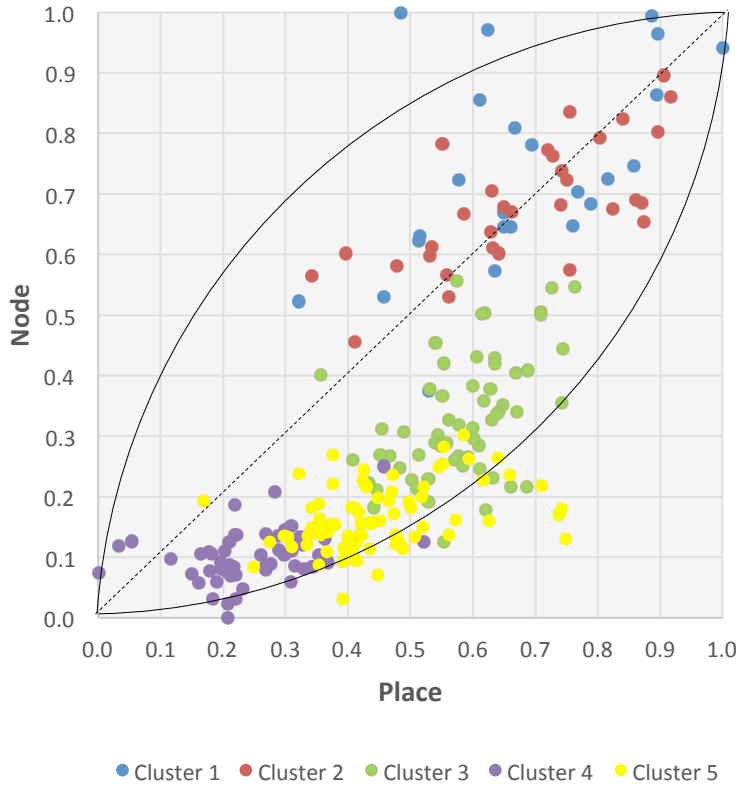
6 Node-Place Index Night



UNIVERSITY OF LEADING THE WAY WESTMINSTER

Outputs

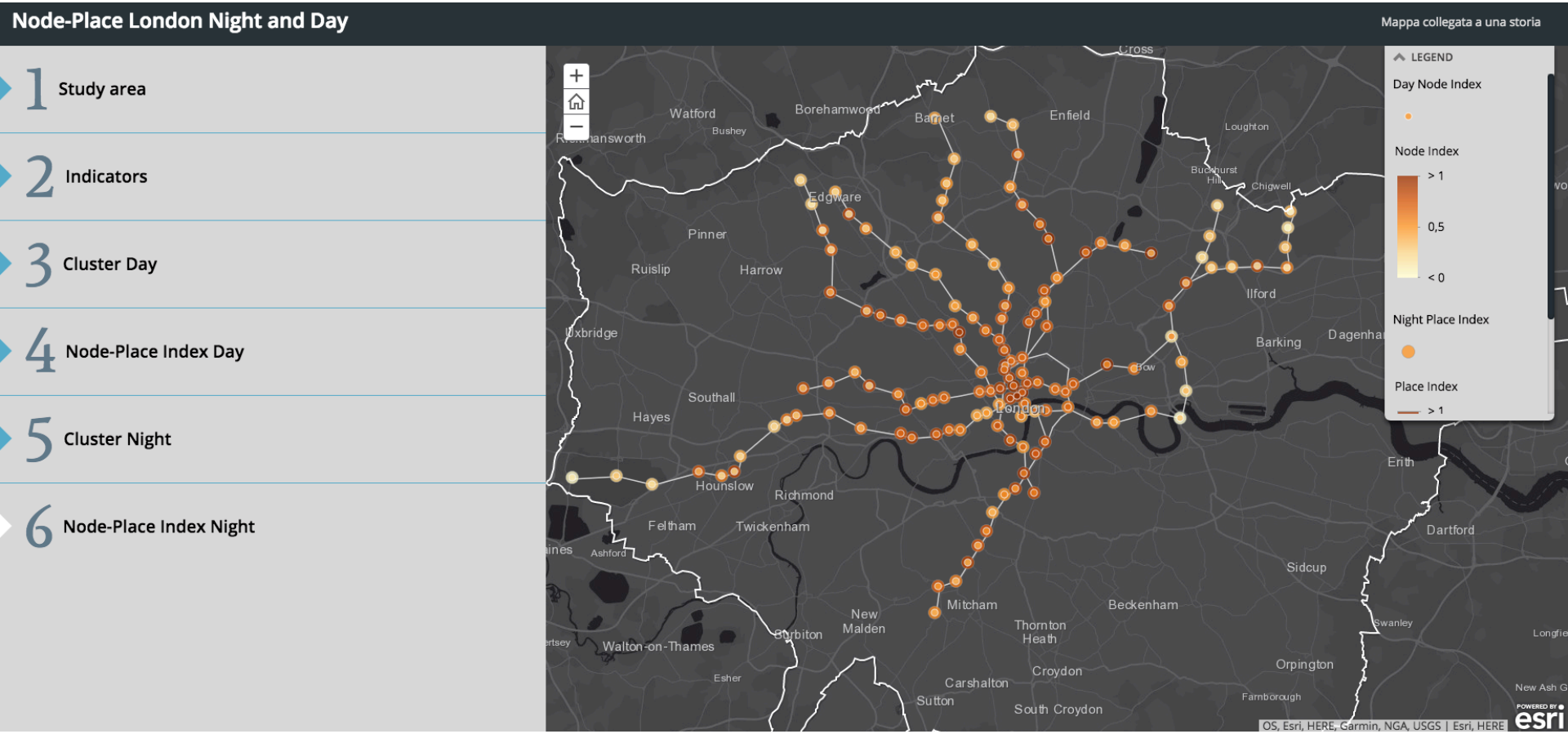
Station area cluster analysis - day



	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	All
	24	32	61	54	81	252
D_P1	0,340	0,578	0,675	0,299	0,514	0,498
D_P2	0,474	0,271	0,058	0,008	0,019	0,101
D_P3	0,947	0,878	0,659	0,179	0,419	0,534
D_P4	0,463	0,651	0,640	0,236	0,381	0,455
D_P5	0,128	0,128	0,114	0,142	0,108	0,121
D_P6	0,110	0,197	0,297	0,168	0,379	0,265
D_P7	0,091	0,134	0,131	0,322	0,261	0,210
D_P8	0,399	0,128	0,023	0,010	0,011	0,066
D_N1	0,545	0,499	0,359	0,127	0,276	0,318
D_N2	0,110	0,104	0,211	0,678	0,453	0,366
D_N3	0,947	0,878	0,659	0,179	0,419	0,534
D_N4	0,750	0,969	0,049	0,000	0,000	0,206
D_N5	0,596	0,649	0,252	0,000	0,008	0,203
D_N6	0,426	0,155	0,094	0,031	0,064	0,110
D_N7	0,394	0,156	0,094	0,031	0,062	0,107
D_N8	0,823	0,895	0,656	0,056	0,169	0,417
Place_Index	0,369	0,371	0,325	0,171	0,262	
Node_Index	0,574	0,538	0,297	0,138	0,181	

Output

Node-place night



UNIVERSITY OF LEADING THE WAY WESTMINSTER

Output

Station area cluster analysis - night

Node-Place London Night and Day

Mappa collegata a una storia

1 Study area

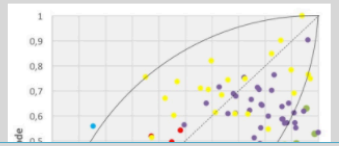
2 Indicators

3 Cluster Day

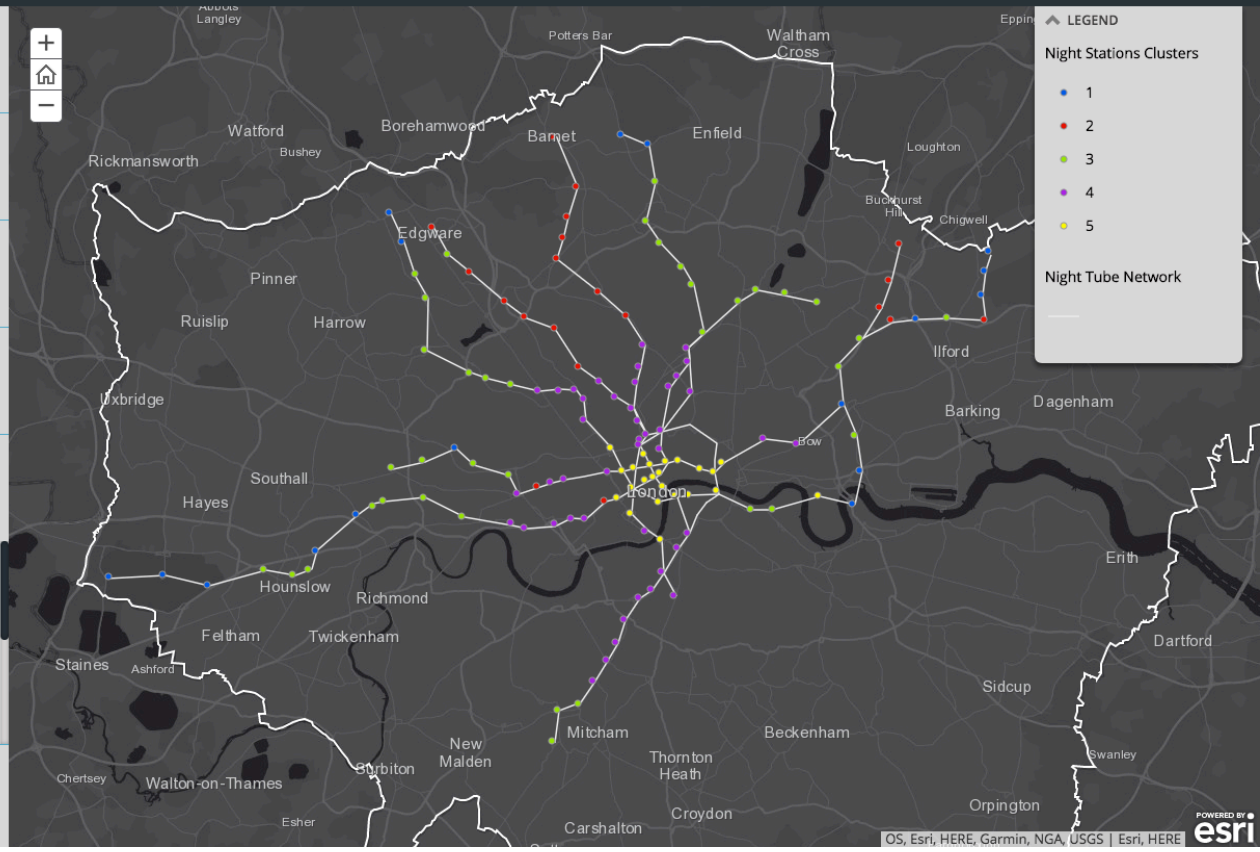
4 Node-Place Index Day

5 Cluster Night

Node-Place Night



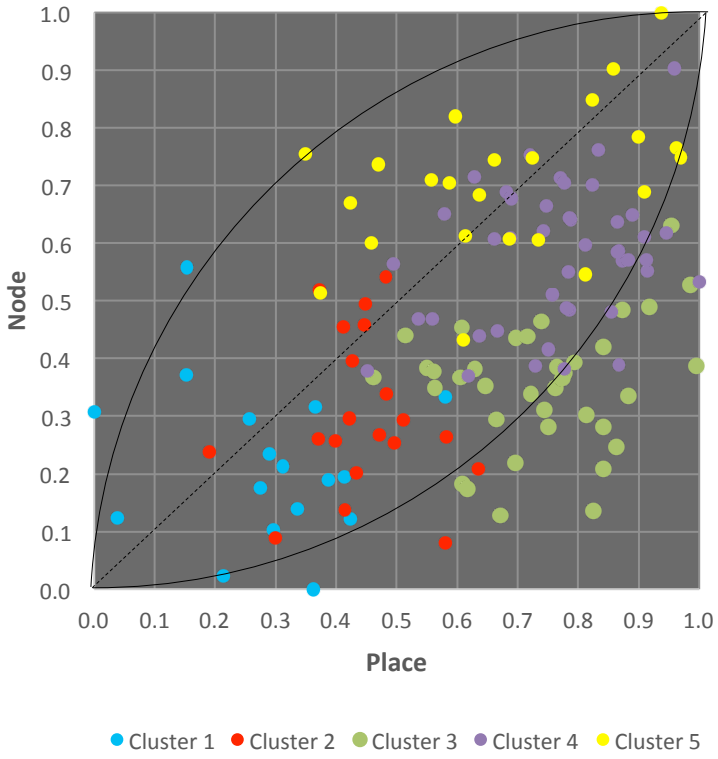
6 Node-Place Index Night



UNIVERSITY OF LEADING THE WAY WESTMINSTER

Output

Station area cluster analysis - night



	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	All
	17	20	37	44	23	141
D_P1	0,192	0,464	0,608	0,751	0,492	0,563
D_P2	0,010	0,017	0,018	0,069	0,519	0,115
D_P3	0,390	0,423	0,563	0,452	0,435	0,467
D_P4	0,125	0,396	0,350	0,627	0,565	0,451
D_P5	0,147	0,187	0,519	0,324	0,158	0,307
D_P6	0,560	0,424	0,493	0,249	0,235	0,373
D_P7	0,020	0,011	0,009	0,030	0,350	0,073
D_P8	0,126	0,296	0,438	0,572	0,140	0,373
D_N1	0,096	0,072	0,144	0,213	0,474	0,203
D_N2	0,383	0,530	0,333	0,365	0,305	0,372
D_N3	0,239	0,328	0,425	0,724	0,948	0,567
D_N4	0,656	0,466	0,743	0,776	0,813	0,715
D_N5	0,158	0,463	0,408	0,850	0,896	0,603
Place_Index	0,196	0,277	0,375	0,384	0,362	
Node_Index	0,306	0,372	0,411	0,586	0,687	

Discussion and results

- Cluster 1 (for both day and night analysis) is in the ‘stress’ area with low functional mix (mostly jobs).
- Cluster 5 in the ‘dependency’ area and with stronger ‘place’ characteristics than ‘node’ characteristics. Further densification should be joined by radial connection among the radial lines
- Cluster 4 in the ‘unstrained place’ area (see previous comment)
- Main component is the network centrality (justified by the strong radial structure of the London tube)

TOD strategies

How to use the tool

- identifying stations with comparable contextual circumstances
- supporting performance assessments
- allowing for descriptions of development potentials and future adaptations by class and by stations: support for the identification of ‘node’ and ‘place’ strategies for each station (for the night and day time)

Limitations and further steps

- Lack of data for the DLR and Overground (day time)
- Night tube data only available for the first year
- Night tube network do not include the Overground (just opened in December 2017)
- The connectivity do not take into account the bus network

- The node and place index are not weighted
- Detailed small scale (qualitative and quantitative) analysis for each station (an online atlas of Tube stations)
- Definition of a set of strategies for each stations

Let’s talk!

UNIVERSITY OF
LEADING
THE WAY
WESTMINSTER